

## REMARKS

### Discussion of the Claims

Claims 1-39 have been examined.

Claims 1-21, 23, 30, and 33-34, have been canceled herein.

Claims 22, 24-28 have been amended.

New dependent claim 68 has been added.

Independent claim 22 as amended now recites:

A method of forming an anode for a zinc/air cell having an anode cavity therein, comprising the step of:

a) forming a wet mixture comprising zinc particles, a binder comprising polyvinylalcohol and a gelling agent, and water;

a.1) inserting said wet mixture into a mold cavity;

a.2) applying pressure to said wet mixture in said mold cavity thereby compacting said wet mixture within said mold cavity;

a.3) ejecting said compacted wet mixture from said mold cavity thereby producing a molded wet mixture having a molded shape, whereupon said molded wet mixture retains its molded shape;

b) drying said molded wet mixture to evaporate water therein and thereby producing a dry solid mass comprising said zinc particles, said solid mass retaining its molded shape;

c) inserting said solid mass into the anode cavity of a zinc/air cell; and

d) adding an aqueous alkaline electrolyte to the anode cavity whereby said aqueous electrolyte is absorbed by said solid mass, said aqueous electrolyte activates said gelling agent, and thereby forms said anode.

Steps a.1, a.2, and a.3 have been added by amendment herein.

Step a.2 specifically recites that pressure is applied to the wet mixture in the mold cavity thereby compacting the wet mixture in said mold cavity.

Step a.3 recites the step of ejecting the compacted wet mixture from the mold cavity thereby producing a molded wet mixture having a molded shape, whereupon said molded wet mixture retains its molded shape.

The term "fluid" in step d) has been changed to aqueous alkaline electrolyte.

A new dependent claim 68 has been added, which recites the method of claim 22, wherein the pressure applied to said wet mixture in step a.2 corresponds to a force of between about 10 and 300 pounds applied by a plunger to said wet mixture in said mold cavity being cylindrical and having a diameter between about 3 and 7 mm, thereby compacting said wet mixture within said mold cavity. (Support in the specification appears at p. 24, lines 15-24 and Figs. 1 and 3B) The representative mold cavity 630 (Fig. 3B) can be cylindrical as in the zinc/air cell anode cavity 255 (Fig. 1).

Additionally the phrase "dimensionally stabilized" which appeared in original claim 22 has been replaced with language that the mass "retains its molded shape". Thus, amended claim 22 now reflects that both the molded wet mixture upon being ejected from the mold cavity (step a.3) has the property that it retains its shape, and the dry solid mass (step b) resulting from drying the molded wet mixture also retains its shape. Support appears in the specification, for example, at p. 8, lines 19-24 and p. 14, lines 20-26.

Support for step a.2 of .."applying pressure to said wet mixture in said mold cavity thereby compacting said wet mixture within said mold cavity" is recited in the specification:

"The wet zinc paste 815a is molded under pressure by applying a pressure to the plunger top 640 thereby injecting plunger 645 into die cavity 630, for example, in 2-3 seconds, causing the wet zinc paste 815a to become compacted and molded into the cavity 630 shape. Typically, a moderate force can be applied to the plunger, desirably under about 400 pounds force, typically between about 10 and 300 pounds. Such force is applied in this manner to the exposed surface of the wet zinc paste 815a by a stroke of plunger 645, for die cavities 630 having diameter, for example, between about 3 and 7 mm." (Specification, p. 24, lines 15-24)

The molded wet mixture (molded wet zinc paste) is compacted within the mold die and when removed from the mold die, it has the property that it "retains it shape". This is clearly recited, for example in the specification as follows:

"An aspect of the invention is directed to preparing an aqueous wet zinc paste and molding the paste in the approximate shape of the anode cavity for the alkaline cell or zinc/air cell. This can be done conveniently by applying the wet paste into a

steel, ceramic or plastic die having a cavity therein in the approximate shape of the cell's anode cavity. The paste fills the cavity under pressure and thereby assumes the cavity shape. The paste can be pressure- molded in the die cavity under ambient temperatures for a short time, typically 2-3 seconds. The paste molded in this manner forms a wet zinc mass (wet preform) which is readily removable from the die. The wet zinc mass (wet preform) has sufficient structural integrity so that it can stand alone outside of the die while retaining its molded shape. The stand alone wet preform is then heated to evaporate water, thereby resulting in a solid, dried, porous zinc mass (solid preform) which can be stored until the cell is ready for assembly." (Specification, p. 8, lines 9-24)

#### **THE INVENTION**

Normally a slurry comprising zinc or zinc alloy particles, gelling agent, and aqueous potassium hydroxide electrolyte (and optional surfactants) is made and pumped into the anode cavity of the conventional alkaline cell, for example, a zinc/MnO<sub>2</sub> or zinc/air cell. Such "zinc anode slurry" or "gelled slurry", as it is commonly referenced in the art, is in a semi gelled state and has the consistency of a heavy fluid with zinc particles dispersed therein. The fluid may therefore be pumped or dispensed as a heavy liquid at ambient temperatures. However, since the fluid is in a semi gelled state there are difficulties associated with pumping such heavy fluid into small or irregular shaped anode cavities. For example, the dispensing nozzle and associated pumping equipment can become clogged and has to be periodically cleaned. There are practical limits to how small the dispensing nozzle can be so there are more potential problems associated with dispensing

the conventional zinc anode slurry into small or irregularly shaped anode cavities.

Applicant has discovered that a dry solid porous mass of anode material comprising the necessary zinc particles may be formed into the shape of the anode cavity, typically cylindrical, (but of any desired shape) and then stored away until needed. During cell assembly the dry solid porous mass of anode material is simply inserted into the anode cavity of the cell. Then alkaline electrolyte is added after the dry solid porous mass is inserted into the cell's anode cavity, whereupon the electrolyte is immediately absorbed into the porous mass, which expands thereby and forms a gelled slurry-like anode mixture. This technique has the advantage of forming the anode into a dry molded shape, without concern for the need to pump a "gelled anode slurry" mixture into a small or irregular shaped anode cavity. Thus, the dry molded porous mass (solid preform) comprising the necessary zinc particles therein, is simply inserted into the cell's anode cavity. Aqueous electrolyte, typically aqueous potassium hydroxide, is then added and absorbed by the molded dry mass to form the active gelled anode mixture (active anode slurry equivalent). Thus the need to use pumping equipment for the conventional gelled anode slurry mixture is avoided.

Applicant has discovered that by first forming a wet zinc paste mixture comprising zinc particles, binder material comprising polyvinylalcohol and a gelling agent, and water, such paste mixture may be inserted into a die cavity mold. The mixture is not yet in a gelled or semi gelled state, since there is no alkaline electrolyte yet present in the mixture to activate the gelling agent. The paste mixture may be pressure molded within cavity mold at ambient temperature into any desired shape and

size. As described in detail in the application (supra), a plunger under pressure may impact the exposed surface of the wet anode paste mixture in the die cavity thereby compacting the wet paste mixture within the die cavity mold. The force of the plunger on the wet anode paste may typically be between about 10 and 300 pounds for representative die cavity diameter between about 3 and 7 mm. (Specification at p. 24, lines 15-24.) The compacted paste is thus molded to the shape of the mold cavity, which may be cylindrical or of any other shape. When the molded wet mixture (molded wet zinc paste) is ejected from the mold cavity, it was discovered that the molded paste mixture could be left free standing in ambient temperature, that is, it retained its shape. Thus, since the molded wet paste mixture "retains its shape", it could be readily passed, in free standing form, into an oven and dried as described in the application to evaporate water therein and form the dry porous mass. (See, Specification at p. 8, lines 9-24.) The dry porous mass also "retains its shape" and may be stored until ready for use for insertion into the alkaline cell anode cavity.

It could not be expected that a wet mixture of zinc particles could be pressure molded into a free standing wet molded mixture, which retains its shape. As is known, liquids and paste mixtures are normally not compressible. And even if compressible to some degree, liquids and wet zinc mixtures, per se, would not be expected to be molded into a free standing form, that is to retain its molded shape, simply by utilizing Applicant's pressure molding technique.

It is theorized that as the wet paste mixture of the present invention is compacted within the mold cavity under the pressure exerted by the plunger, such compaction causes a closer physical

interaction between the zinc particles and the polyvinylalcohol molecules present within the wet paste, though the zinc and polyvinylalcohol remain unreacted. Such physical interaction is believed to increase the cohesive forces between the zinc particles and polyvinylalcohol binder making possible the resulting molded free standing, wet paste product, which retains its shape. The interaction of the polyvinylalcohol 824 and zinc particles 822 may be seen in the photomicrograph of Fig. 4.

### **THE REJECTION**

Claims rejections of various claims within claims 1-21 under 35 UASC 112, 35 USC 102 and/or 35 USC 103 are rendered moot in view of the cancellation of claims 1-21 herein.

Claims 1-39 are provisionally rejected under the judicially created obviousness type double patenting as being unpatentable over claims 1-41 of copending Application no. 10/613,686. Claims rejection of claims 1-21 on the basis of obvious type double patenting is rendered moot in view of the cancellation of claims 1-21 herein.

Claims 22-39 thus stand provisionally rejected on the basis of obvious type double patenting as being unpatentable over claims 1-41 of copending application No. 10/613,686. Applicant has amended independent claim 22 herein. However, Applicant is prepared to file a Terminal Disclaimer if the Examiner does not withdraw this double patenting rejection, as the two Applications are commonly owned as shown by Assignment of the subject Application 10/613,681 at Reel 014297/ Frame 0668 and cited Application 10/613,686 at Reel 014283/ Frame 0629.

Claims 33 and 34 containing specific trademark names have been canceled. Thus, the rejection of claims 33 and 34 under 35 USC 112 for the inclusion of trademark names is rendered moot.

Claim 22 is rejected under 35 USC 112 for use of the term "such as" rendering the claim indefinite, and for not having antecedent basis in the claim for the phrase "the anode cavity," and for use of the term "dimensionally stabilized". Claim 39 is rejected under 35 USC 112 for insufficient basis for "approximate shape of the anode cavity".

Independent Claim 22 has been amended herein deleting the term "such as". Claim 22 has been amended to include antecedent basis in the preamble for "anode cavity" appearing in the body of claims 22 and 39. The term "dimensionally stabilized" as recited in claim 22 has either been deleted or replaced with the phrase "mass retaining its shape". Thus the rejections of claim 22 under 35 USC 112 are now believed to be cured and withdrawal of this basis of rejection is requested.

**Claims 22, 23, 26-27 and 30-35 are rejected under 35 USC 103(a) as being unpatentable over Une (JP 56-116270) in view of Lin (U.S. 6,300,011 B1).**

The Examiner states that with regard to claims 22 and 26, Une (JP '270) discloses in the abstract a method of forming an anode for a zinc/air cell comprising the steps of forming a mixture comprising zinc powder, a binder of PVA, and water. The Examiner states Une discloses that after this mixture is made it is placed in a mold before it is dried, where the drying vaporizes the water therein. The Examiner interpretes Une as showing that upon drying a "dimensionally stabilized mass" comprising zinc particles, is produced.



The Examiner acknowledges that Une (JP '270) does not disclose the method step of inserting the (dry) mass into the anode cavity of a zinc/air cell and adding fluid, comprising aqueous alkaline electrolyte of potassium hydroxide, to the anode cavity whereby said fluid would be absorbed by said mass, and said mass expand thereby to form the anode. The Examiner acknowledges that Une does not disclose that the binder of PVA further comprises a gelling agent binder which is a crosslinked acrylic acid polymer (CARBOPOL C940) or a starch graft copolymer of polyacrylic acid and polyacrylamide (WATER-LOCK A221). The Examiner states that Une (JP'270) also does not disclose wherein prior to drying the mixture comprises indium in total amount between about 200 and 1000 ppm of the zinc.

The Examiner states that with respect to claims 22, 23, and 27 reference Lin (US '011) discloses inserting a dimensionally stabilized mass into a zinc/air cell (col. 6, lines 10-13) and adding a second fluid of potassium hydroxide to said mass whereby the potassium hydroxide is absorbed into said mass to the anode (col. 6, lines 45-48). Therefore the Examiner indicates that it would have been obvious to one of ordinary skill in the art to add potassium hydroxide as electrolyte to be absorbed by the (dry) anode mass of Une, because Lin teaches the electrolyte may be added to a dry anode mixture.

The Examiner states that with regard to claims 30-34 Lin (US '011) discloses that the above referenced gelling agents (CARBOPOL C940 and WATER-LOCK A221 gelling agents) are well known in the art and thus could be added to the zinc anode mixture as disclosed in Une for use in a zinc/air cell. The Examiner states that with respect to claim 35, Lin discloses the anode mixture comprising

zinc may further comprise indium in total amount between about 100 and 1000 ppm of zinc.

**Claims 24, 25, 28, 38, and 39 are rejected under 35 USC 103 (a) as being unpatentable over Une (JP 56-116270) in view of Lin (US 6,300,011 B1) as applied to claims 22, 23,26,27 and 30-35 as above, and further in view of Kosta (US 3,784,406)**

The Examiner states that Une (JP '270) and Lin ('011) disclose the method of forming an anode for a zinc/air cell as described above. That is, Une discloses a method of forming an anode for a zinc/air cell comprising the steps of forming a mixture comprising zinc powder, a binder of PVA, and water and then drying the mixture. Lin discloses adding gelling agents such as CARBOPOL C940 and WATERLOCK A221 to the anode mixtures for zinc/air cell.

The Examiner acknowledges that Une and Lin do not disclose wherein the mass comprising zinc particles is molded into the approximate shape of an anode cavity of a zinc/air cell prior to drying and then inserted as a solid porous mass into an anode cavity of a zinc/air cell.

The Examiner states that Kosta (US 3,784,406) discloses a method of forming an anode for an alkaline cell comprising: forming a mixture comprising zinc particles, polymeric binder dispersed in water which is subsequently dried (col. 5, lines 1-12. The Examiner maintains that Kosta discloses that a dimensionally stabilized anode mass is formed upon drying. The Examiner indicates, for example, in Kosta Fig. 2, each electrode deposit 20 is held to be a dimensionally stabilized mass.

The Examiner states that it is held that Kosta upon drying produces a "dimensionally stabilized mass", for example, in Fig. 2

of Kosta each (wet) electrode deposit 20 is held to be a dimensionally stabilized mass. The Examiner references that these wet masses 20 are then put through a drying oven and heated to a dry solid form. With respect to claim 28 the Examiner maintains that the mass is shaped (wet dispersion patches 20) and is passed to an oven for drying. With regard to claim 24 the Examiner maintains that Kosta discloses that after the masses are dried in an oven, the electrodes which are formed may be solid masses. With regard to claims 38-39 the Examiner maintains that Kosta discloses that the masses may be stored in air and it would have been obvious to mold the (dry) anode mass into the shape of anode cavity before inserting the anode into the zinc/air cell prior to adding electrolyte thereto.

Kosta ,however, does not disclose the use of polyvinylalcohol as a binder material and in fact polyvinylalcohol is nowhere mentioned in this reference. Kosta does not disclose inserting a wet mass comprising zinc particles into a mold cavity and applying pressure to the wet mass to compact the wet mass therein, and then ejecting the compacted wet mass from the mold cavity. Kosta does not specifically teach inserting a dried electrode mass into the anode cavity of an alkaline cell and of subsequently adding alkaline electrolyte thereto.

Claim 29 is rejected under 35 USC 103(a) as being unpatentable over Une (JP 56-116270) in view of Lin (US 6,300,011 B1) as applied to claims 22, 23,26,27 and 30-35 above, and further in view of Li (US 5,538,813)

Une (JP 56-116270) discloses adding a polyvinylalcohol thickener to help form a zinc anode paste. Lin does not disclose

adding polyvinylalcohol binder to a zinc anode mixture. The Examiner acknowledges that neither reference discloses a polyvinylalcohol having a molecular weight of between 85,000 and 146,000.

The Examiner applies Li for disclosing that polyvinylalcohol (PVA) binders are known in the art. Li discloses a polymer support comprising PVA, preferably PVA with  $H_3PO_4$  incorporated therein which functions as polymer support for electrolyte active species such as KOH, NaOH, or LiOH. The PVA is described in Li as being available commercially in a preferred range of molecular weights between about 80000 to 140000, which overlaps Applicant's expressed range in claim 29.

**Claims 36 and 37 are rejected under 35 USC 103(a) as being unpatentable over Une (JP 56-116270) in view of Lin (US 6,300,011 B1) as applied to claims 22, 23, 26, and 27 and 30-35 above, and in further view of Chalilpolyil (US 5,401,590).**

The Examiner applies Une (JP '270) and Lin (US '011) as above for disclosing the method of forming an anode for a zinc/air cell as above indicated. Applicant's claim 36 and 37 are directed to adding a surfactant to the anode mixture. Examiner applies Chalilpolyil specifically for disclosing that a surfactant which may be a phosphate ester may be added to an anode mixture comprising zinc particles. The Examiner points out that Chalilpolyil at col. 5, lines 38-41 discloses the use of a surfactant which may be a phosphate ester as an additive to a zinc anode to reduce hydrogen evolution. Applicant acknowledges that such surfactants, per se, are known additives to zinc anode mixtures.

## ARGUMENTS AGAINST THE REJECTION

### I. Argument Against Reference Une - Kokai JP 56[1981]-116,270

Une JP '270 DOES NOT DISCLOSE APPLICANT'S STEP OF INSERTING A WET ZINC MIXTURE INTO A MOLD CAVITY AND APPLYING PRESSURE TO THE WET MIXTURE THEREIN TO COMPACT THE MIXTURE AND EJECTING THE COMPACTED WET ZINC MIXTURE FROM THE MOLD CAVITY

Une JP'270 DOES NOT DISCLOSE DRYING A WET ZINC MIXTURE TO OBTAIN A DRY SOLID ZINC MIXTURE. JP'270 DRIES A WET ZINC MIXTURE TO THE POINT OF FORMING A PASTE-TYPE ZINC AND A PASTE-TYPE ZINC IS NOT A DRY SOLID MASS

Une JP'270 (full translation submitted herewith by supplemental IDS) is concerned with forming a zinc particle alloy with indium and lead, in situ, while the zinc electrode for a zinc-air cell is being formed. This is alleged to provide an advance over conventional methods of first forming the zinc alloy powder outside of the cell. Une JP'270 describes the conventional methods, of first forming the zinc alloy powder outside the cell, cause inefficiencies because the zinc powder must be separately first alloyed before the zinc electrode is formed. Such conventional method also produces waste solutions which must be discarded.

In Une JP'270 a method is described whereby the zinc powder is alloyed with metals such as indium and lead simultaneously during the formation of the zinc electrode. This is done, as recited in the example, by mixing indium chloride and lead nitrate in water to form an aqueous solution containing 3% lead and 0.1% indium. 12.5g of polyvinyl alcohol is added as thickening agent to 125 cc of this aqueous solution. The mixture is agitated and 500g of zinc powder is added and the mixture again agitated allowing the zinc to react and become alloyed with the indium and lead present in the solution, whereby a wet paste is simultaneously

formed. The wet paste is introduced into a mold and dried to evaporate some water and causing the zinc-indium-alloy powder aqueous mixture to form a paste type consistency with polyvinylalcohol. The reference states that the dried zinc mixture has a **paste type** consistency. **One would conclude from this that the zinc mixture is not dried to a solid mass comprising zinc alloy, since even the dried molded mixture has a paste type consistency and there is no reference to such solid mass of zinc alloy material.** It is not stated in the reference at what stage alkaline electrolyte would be added to this zinc-alloy paste mixture.

In any event it is clear that Une JP'270 is preoccupied with forming a zinc alloy powder simultaneously with the formation of **paste-type zinc** which is ready for insertion into the electrode cavity of a zinc-air cell. **While polyvinylalcohol is used in forming the zinc paste there is no disclosure of pressure molding such paste. Specifically there is no disclosure in JP'270 of inserting a wet zinc paste into a mold cavity and applying pressure to the paste thereby compacting the paste within the mold cavity and subsequently ejecting the molded paste from such mold cavity forming a molded wet zinc mixture which retains its shape.**

There is also no step revealed in Une JP'270 which would lead one of ordinary skill to believe that a dry solid mass of zinc was ever produced at any stage of the processing. There is only reference to the production of a paste-type zinc and a paste-type zinc would not suggest Applicant's dry solid mass comprising zinc particles.

## II. Argument Against Reference U.S. 6,300,011 B1 (Lin)

**LIN '270 DOES NOT DISCLOSE APPLICANT'S STEP OF INSERTING A WET ZINC MIXTURE INTO A MOLD CAVITY AND APPLYING PRESSURE TO THE WET MIXTURE THEREIN TO COMPACT THE MIXTURE AND EJECTING THE COMPACTED WET ZINC MIXTURE FROM THE MOLD CAVITY**

The reference is directed to forming an anode mixture for a zinc-air cell. A metal binder such as indium or bismuth is first heated to a temperature above its melting point and added as a molten liquid to zinc powder. Alternatively, the metal binder (solids) can be added to zinc powder and the mixture heated to a temperature which is above the melting point of the metal binder. In either case the metal binder is above its melting point for a period. (The melting point of the metal binder is below the melting point of the zinc so the zinc does not become molten.) The mixture comprising particulate zinc and molten (liquified) metal binder is then cooled to about room temperature. As the mixture cools the metal binder solidifies and adheres to individual zinc particles.

The Examiner applies Lin to Applicant's claims 30-34. It is acknowledged that Lin discloses Applicant's preferred gelling agents as gelling agent additive to the zinc anode mixture for a zinc/air cell. Specifically, Lin discloses addition of crosslinked acrylic acid copolymer gelling agent (CARBOPOL C940) and the starch graft copolymer (WATERLOCK A221) gelling agents to zinc anode mixtures for zinc/air cell. **However, it should be noted that Lin does not mention or contemplate the addition of Applicant's polyvinylalcohol binder to the zinc anode mixture.**

The Examiner applies Lin at col. 6, lines 10-13 to Applicant's claims 22, 23, and 27. It is described therein that the anode casing of the cell may first be filled with anode active material prepared from a mixture of particulate zinc and molten

metal binder. Upon cooling of the mixture a powdered gellant material is added. The mixture is still dry and not a wet mixture at this point. A solution of aqueous KOH electrolyte may then be added at this point to the dry mixture of zinc, cooled binding metals, and gellant powder. (Col. 6, lines 49-51). In this case the wet mixture which is formed is already within the anode casing. **There is no indication or suggestion that such wet mixture could retain its shape if removed from the anode casing or before insertion into the anode casing as a wet mixture.**

Alternatively, it is described in Lin '270 that a dry mixture comprising the zinc particles (including metal binder) and gelling agent powder may be formed. The aqueous electrolyte can then be added to this mixture to form a wet mixture which then may be inserted into the anode casing. (col 6, lines 45-48) In such procedure there is not indication that the wet anode mixture, which was formed outside of the anode casing could retain its shape, if it were molded into the shape of the anode casing.

**In any event there is no disclosure or contemplation in Lin '270 of Applicant's step of inserting a wet zinc mixture into a mold cavity and applying pressure to the wet mixture therein to compact the mixture and ejecting the compacted wet zinc mixture from the mold cavity.**

### **III. Argument Against Reference Kosta U.S. Patent 3,784,406**

**KOSTA DOES NOT CONTEMPLATE APPLICANT'S STEP OF INSERTING A WET ZINC MIXTURE INTO A MOLD CAVITY AND APPLYING PRESSURE TO THE WET MIXTURE THEREIN TO COMPACT THE MIXTURE AND EJECTING THE COMPACTED WET ZINC MIXTURE FROM THE MOLD CAVITY, RESULTING IN A MOLDED WET ZINC MIXTURE WHICH RETAINS ITS SHAPE**



Kosta transfers his wet zinc mixture from applicator roller 600 to patch roller 220 and then a wiping action is applied to the surface of patch roller 600 thereby wiping patches of the wet zinc mixture from the patch roller 220 onto continuous carrier strip 50. Since there are indentations 224 along the surface of patch roller 600, the wet deposits 20 are separated from each other by the length of indentations 224 on the patch roller surface. The wiping action appears to be the result of blade-like action of back bar assembly 400 which scrapes patches of wet zinc mixture onto the continuous carrier strip 50 as it passes between assembly 400 and the surface of patch roller 220.

Kosta is satisfied with forming patches of wet deposits 20. He does not contemplate forming the patches of the wet zinc mixture into any particular shape other than in the form of wet electrode deposits 20 as shown in simple patch-like or rectangular shape in Figs. 1 and 2. The only other techniques Kosta mentions for forming the wet deposits 20 besides the wiping method is possibly by use of other roller systems, spraying, and brushing. (col. 3, lines 34-37). The wet deposits 20 are then dried in an oven to form dried solid electrode deposits of same patch-like shape.

Kosta does not disclose or contemplate any methods of forming wet deposits into shapes other than rectangular patches as shown in Figs. 1 and 2. By contrast Applicant using the described pressure technique can mold the wet zinc mixture into essentially any desired shape. **It should be clear that Kosta does not disclose any pressure molding techniques for forming the wet zinc mixture deposits 20. Specifically, there is no disclosure or suggestion in Kosta of inserting the wet zinc mixture into a mold cavity and applying pressure to the wet zinc mixture therein as**

Applicant has described, thereby resulting in a molded wet zinc mixture which has the property of retaining its shape when ejected from the mold cavity.

**Kosta does not disclose the use of Applicant's binder comprising polyvinyl alcohol as a component of the wet zinc mixture.** By contrast Applicant has determined by experimentation that polyvinylalcohol has special properties which makes it desirable for use as binder material for zinc particles in a wet zinc mixture subjected to pressure molding effected by the action of a plunger pressed against the wet zinc mixture. That is, there appears to be a physical interaction between the polyvinylalcohol and zinc particles which takes place and increases as pressure is applied to the wet zinc mixture. This forms a molded wet mixture which takes on the shape of the mold cavity and which upon ejection from the mold cavity "retains its shape" so that it may subsequently be passed to an oven for drying into a solid electrode mass of same shape. Applicant then inserts the solid dry electrode mass into an alkaline cell anode cavity and adds alkaline electrolyte. The polyvinylalcohol does not interfere with obtaining the desired electrochemical activity and desired performance of the anode upon cell discharge. (See Applicant's cell performance data in his specification at Tables 1 and 2).

By contrast Kosta does not contemplate pressure molding, that is, inserting a wet zinc mixture into a die mold cavity and then applying pressure to the wet zinc mixture therein and compacting the wet mixture. **Kosta makes no mention of adding polyvinylalcohol to the wet zinc mixture and makes no mention of compacting the wet zinc mixture.** Kosta also does not describe inserting his dry zinc mass into an anode cavity of an alkaline cell and adding electrolyte thereto. But even assume this is his intent, he gives

no indication that he could use Applicant's pressure molding technique which compacts the wet zinc mixture. He gives no indication that the use of polyvinylalcohol as an additive to the mixture would make it possible to pressure mold the wet zinc mixture in the manner Applicant has described to result in a molded wet zinc mixture which upon ejection from the mold, retains its shape.

One skilled in the art would need the benefit of Applicant's disclosure to fill in the missing information, namely of **inserting the wet zinc mixture comprising zinc and polyvinyl alcohol into a mold cavity and applying pressure to the mixture therein as Applicant has described, thereby resulting in a molded wet zinc mixture which has the property of retaining its shape when ejected from the mold cavity.** Such hindsight analysis, however, is inapplicable.

#### **IV. Argument Against U.S. Patent 5,538,813 (Li)**

This reference is directed to an electrochemical storage device having asymmetric electrodes and an electrolyte which may include polyvinylalcohol (PVA) to provide a support structure for an electrolyte active species which may be an acidic or basic. The first electrode may be, for example, fabricated from polyaniline. The second electrode may be fabricated from ruthenium dioxide (RuO<sub>2</sub>) (Example 1). Specifically, the PVA is indicated as providing a good polymer support structure into which may be incorporated an electrolyte active species, which may include a base such as KOH, NaOH, or LiOH. The PVA is described as being available commercially in a preferred range of molecular weights between about 80000 to 140000 for the electrolyte support

structure. Other molecular weights of PVA such as 30000 to 50000 or 50000 to 80000 are also indicated as useful. A preferred polymer support structure for the electrolyte active species is described as a PVA polymer support with  $H_3PO_4$  incorporated therein. A method of making such a PVA/ $H_3PO_4$  polymer support for the electrolyte is described for example at col. 3, lines 55-64.

The use of PVA as an electrolyte additive is disclosed in the reference and a range of molecular weights for the PVA are recited which overlap Applicant's range as recited in Applicant's dependent claim 31. However, Applicant's claims 22-39 are directed to a method of forming an anode involving the molding steps as recited in Applicant's amended independent claim 22. This reference is not concerned with and does not contemplate Applicant's method of preparing and molding a zinc anode mixture as recited in Applicant's amended independent claim 22.

#### **V. Argument Against U.S. Patent 5,401,590 (Chalilpoyil)**

Chalilpoyil ('590) is directed to a gelled anode slurry of zinc particles for alkaline cells, wherein the anode slurry is formulated to inhibit load voltage instability and reduce hydrogen gassing. In order to prepare the improved anode, a slurry mixture of both anionic surfactant and a non-ionic surfactant are added to a mixture of zinc particles, gelling agent and aqueous KOH. As in the preceding reference, it should be appreciated that the anode product formed is a gelled slurry, but because it is a "slurry" it is a fluid and may be stored in a storage tank and dispensed therefrom as fluid mixture into the cell's anode cavity. (See, e.g. col. 6, lines 43-65). The Examiner applies this reference against Applicant's claims 36-37. Specifically, the Examiner

applies the reference at col. 5, lines 38-41 for disclosing adding a surfactant such as an organic phosphate ester surfactant to a zinc anode mixture. Applicant acknowledges that the addition of such surfactant to a zinc anode mixture, per se, is known.

Chalilpoyil ('590), however, does not disclose pressure molding the wet anode "slurry" and in particular does contemplate the use of applying pressure to a wet zinc mixture within a die mold cavity to compact the wet mixture therein and then ejecting the compacted wet mixture from the mold cavity, as Applicant has described. There is also no molded dry solid mass of zinc particles disclosed or contemplated in this reference either in the form of an intermediate or end product.

#### **VI. Argument Against Patent Kutsumi JP 48[1973]-012690**

Kutsumi JP '690 (translation submitted herewith by supplemental IDS) was not cited by the Examiner in the subject application. However, this reference was cited and applied against copending commonly assigned Application Ser. 10/613686 (Official Action dated May 17, 2006). Accordingly, Applicant is making this reference of record in the present case and distinguishes the present invention over the reference as follows:

Kutsumi JP '690 (translation submitted herewith by supplemental IDS) discloses a mixture of zinc powder, polyvinylalcohol, and an added acetalizing solution. The added acetalizing solution is a mixture comprising 50 parts by weight methanol, 20 parts water, 22 parts zinc sulphates, and 10 parts formalin. (Formalin contains formaldehyde). This acetalizing solution (30 parts by weight) is then added to a mixed powder of 90 parts by weight amalgamated zinc powders and 10 parts of

polyvinylalcohol to from a wet zinc mixture. JP '690 specification recites that this wet zinc mixture is molded under increased pressure to a desired shape and then subjected to heat treatment for 30 minutes at 150° C. During the heat treatment the polyvinylalcohol undergoes partial acetylation causing crosslinking of the polyvinylalcohol at some of the hydroxyl cites in the polyvinylalcohol chain to occur. (Note: Crosslinking would thus occur by reaction of the formaldehyde in the formalin with at least some of the hydroxyl cites along the polyvinylalcohol chain.) After the acetylation the resulting zinc mass was washed with water, with a porous mass being formed.

There is no description or indication of any particular method of molding the wet zinc mass prior to the heating step to bring about the acetylation (crosslinking) reaction. There is no indication, for example, whether the wet zinc mass was placed in a mold cavity; and, if so, then whether it was ever ejected from the mold after it was shaped to the desired shape. Thus, there is no indication in this reference that the molded wet zinc mixture could retain its shape if removed from the mold after it was shaped, but before it was heated to bring about the acetylation reaction. The implication is that the wet zinc mass was heated while still in the mold. However, since the reference is silent as to the method of molding, one can only conjecture.

"Silence or missing information" in a reference as to key techniques employed in conducting a process, which leaves one skilled in the art merely to guess at possibilities, should not constitute prior art as to those techniques.

It will be appreciated that this reference depends on a chemical reaction between polyvinylalcohol and formaldehyde which changes the chemical nature of the polyvinylalcohol at least along

portions of the polyvinylalcohol chain, and causes crosslinking to occur. The partially acetylated polyvinylalcohol is said to exhibit beneficial binding properties for the zinc particles. Thus, the reference teaches achieving improved binding properties of the polyvinylalcohol as used in a wet zinc mixture, primarily by changing the chemical nature of the polyvinylalcohol, not by exerting pressure on a wet mixture of zinc particles and polyvinylalcohol. In any event, there is no disclosure in this reference that there is any step of molding of the wet zinc mixture as described by Applicant, namely, by inserting a wet zinc mixture comprising zinc particles and polyvinylalcohol into a die mold cavity, exerting pressure on the wet zinc mixture as with a plunger to compact the mixture therein, and then ejecting the compacted mixture from the mold cavity, whereupon the compacted wet zinc mixture retains its shape.

**VII. INDEPENDENT CLAIM 22 AS AMENDED HEREIN IS PATENTABLE UNDER 35 USC 103(a) OVER Une (JP 56-116270) IN VIEW OF Lin (US 6,300,011 B1)**

In Une JP'270 (full translation submitted by Supplemental IDS herewith) a method is disclosed whereby zinc powder is alloyed with metals such as indium and lead simultaneously during the formation of the zinc electrode in situ. This is done, as recited in the example, by mixing indium chloride and lead nitrate in water to form an aqueous solution containing 3% lead and 0.1% indium. 12.5g of polyvinyl alcohol is added as thickening agent to 125 cc of this aqueous solution. The mixture is agitated and 500g of zinc powder is added and the mixture again agitated allowing the zinc to react and become alloyed with the indium and lead present in the solution, whereby a wet paste is simultaneously formed. The wet paste is introduced into a mold (presumably the

cell's electrode cavity) and dried to evaporate some water causing the zinc-indium-alloy powder aqueous mixture to form a paste type consistency with polyvinylalcohol. The reference states that the dried zinc mixture has a **paste type** consistency. **One would conclude from this that it is not dried to a solid mass comprising zinc alloy, since even the dried molded zinc mixture has a paste type consistency and there is no reference to such solid mass of zinc alloy material.** It is not described in the reference at what stage electrolyte is added to the paste type zinc-alloy mixture.

In Lin ('011) an anode mixture for a zinc-air cell is formed. The anode mixture can be prepared in situ in the cell's anode cavity. The anode casing of the zinc/air cell can first be filled with a mixture of zinc particles and a molten metal binder comprising molten indium and bismuth. Upon cooling of the zinc mixture, powdered gellant material is added. (col. 6, lines 10-14). Then alkaline electrolyte may be added to form the wet anode mixture in situ. (col. 6, lines 49-51 There is no disclosure or contemplation in this reference of adding polyvinylalcohol to the anode mixture.

Une JP'270 and Lin ('011) disclose some form of molding a mixture of zinc particles as discussed, supra and Une JP'270 includes adding polyvinylalcohol in admixture with zinc particles. **However, neither of these references discloses or contemplates any step of molding of the wet zinc mixture as described by Applicant, namely, by inserting a wet zinc mixture comprising zinc particles and polyvinylalcohol into a die mold cavity, exerting pressure on the wet zinc mixture to compact the mixture therein, and then ejecting the compacted mixture from the mold cavity. Furthermore, none of the references teaches that such**



compacted wet zinc mixture, as Applicant describes, can retain its shape after ejecting said compacted wet mixture from the mold. Applicant has now specifically amended independent claim 22 to recite these intermediate processing steps.

One of ordinary skill in the art would need the benefit of Applicant's disclosure to supply this missing information, that is, Applicant's intermediate steps of molding a wet zinc mixture by inserting a wet zinc mixture comprising zinc particles and polyvinylalcohol into a die mold cavity, applying pressure on the wet zinc mixture to compact the mixture within the mold cavity, and then ejecting the compacted mixture from said mold cavity, whereupon said molded wet mixture retains its molded shape as now recited in amended independent claim 22.

Such hindsight analysis, however, is inapplicable. Applicant's disclosure cannot be used as a blueprint to reconstruct the claimed invention from the isolated teachings of the prior art. Grain Processing Corp. v. American Maize-Products Co., 5 USPQ2d 1788, 1792 (Fed. Cir. 1988). See also, In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). One "cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." In re Fritch, 23 USPQ2d 1780, 1784, (Fed. Cir. 1992) quoting In re Fine, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988).

Applicant's amended independent claim 22 is thus believed patentable over the cited references, since none of these references contemplate Applicant's intermediate steps as above stated with respect to the described method of molding the wet zinc mixture. **In particular, none of the cited references alone or in any combination suggests the inclusion of these**

intermediate steps into the fabric of the method of producing an active zinc anode inserted in a cell's anode cavity as reflected in amended claim 22.

Applicant's disclosure would have to be relied upon to supply this missing information in the context of the process of the invention as now reflected in amended base claim 22. Such hindsight analysis, however, is inapplicable. The rejection of claim 22 under 35 USC 103 is thus believed traversed and withdrawal of the rejection is respectfully requested.

VIII. Applicant's Claim 24, 25, 28, 38, and 39 are patentable under 35 USC 103(a) over Une (JP 56-116270) and Lin (US 6,300,011 B1) as applied to claims 22, 23, 26, 27, 30-35 and further in view of Kosta (US 3,784,406)

Patentability of amended independent claim 22. Claims 24, 25, 28, 38, and 39 depend either directly or indirectly from independent claim 22. The dependent claims 24, 25, 28, and 38 are directed to Applicant's solid porous mass comprising zinc which is formed or being formed from the wet mixture. Claim 39 is directed to molding the wet mixture into the approximate shape of the anode cavity.

As above described, the added reference Kosta ('406) does not disclose any pressure molding techniques for forming his wet zinc mixture deposits 20. Specifically, there is no disclosure or suggestion in Kosta of inserting the wet zinc mixture into a mold cavity and applying pressure to the wet zinc mixture therein as Applicant has described. Kosta does not show inserting a wet mixture into a mold cavity and does not show ejecting a compacted mixture from the mold cavity thereby resulting in a molded wet zinc mixture which has the property of retaining its shape when

ejected from said mold cavity. Rather Kosta transfers his wet zinc mixture from applicator roller 600 to patch roller 220 and then a wiping action is applied to the surface of patch roller 600 thereby wiping patches of the wet zinc mixture from the patch roller 220 onto continuous carrier strip 50. Kosta also does not disclose the use of Applicant's binder comprising polyvinyl alcohol as a component of the wet zinc mixture.

Amended independent claim 22 is believed patentable over the references Une (JP 56-116270), Lin (US 6,300,011 B1), and Kosta (US 3,784,406) as above argued. Specifically, none of these references viewed alone or any combination discloses or suggests Applicant's intermediate steps a.1, a.2, and a.3 of amended base claim 22, namely:

Inserting a wet zinc mixture comprising zinc particles and polyvinylalcohol into a die mold cavity, exerting pressure on the wet zinc mixture to compact the mixture therein, and then ejecting the compacted mixture from the mold cavity. (claim 22, steps a.1, a.2, and a.3) Furthermore, none of the references teaches that such compacted wet zinc mixture, as Applicant describes, can retain its shape after ejecting said compacted wet mixture from the mold (claim 22, a.3). Applicant has now specifically amended independent claim 22 to recite these intermediate processing steps.

Dependent claims 24, 25, 28, 38, and 39 reflect a specific embodiment of the invention and further restrict the subject matter of base claim 22. Therefore, these claims should be deemed patentable if amended claim 22 is allowed. The above rejection is believed traversed and withdrawal of the rejection is requested upon the Examiner's reconsideration.

**IX. Applicant's Claim 29 is patentable under 35 USC 103(a) over Une (JP 56-116270) in view of Lin (US 6,300,011 B1) as applied to claims 22, 23, 26, 27, and 30-35, above, and further in view of Li (US 5,538,813)**

Patentability of amended independent claim 22 has been argued, supra. Claim 29 depends from independent claim 22. Claim 29 recites that the polyvinylalcohol has a molecular weight between about 85000 and 146000.

The added reference Li, as above discussed, discloses use of polyvinylalcohol (PVA) as an electrolyte additive. Li discloses a polymer support comprising PVA, preferably PVA with  $H_3PO_4$  incorporated therein which functions as polymer support for electrolyte active species such as KOH, NaOH, or LiOH. Applicant's claim 29 recites a molecular weight range for the PVA which, per se, overlaps the Li disclosure. Li, however, does not disclose or contemplate Applicant's method of preparing and molding a zinc anode mixture as recited in amended claim 22. Amended independent claim 22 is believed patentable over the references Une (JP 56-116270) in view of Lin (US 6,300,011 B1) as above argued and Li also does not disclose or contemplate Applicant's intermediate molding steps a.1, a.2 and a.3 as now recited in amended base claim 22. Dependent claim 29 reflects a specific embodiment of the invention and further restricts the subject matter of claim 22. Therefore, claim 29 should be deemed patentable if amended claim 22 is allowed. The above rejection of claim 29 is believed traversed and withdrawal of the rejection is requested upon the Examiner's reconsideration.

X. Applicant's Claims 36 and 37 are patentable under 35 USC 103(a) over Une (JP 56-116270) in view of Lin (US 6,300,011 B1) as applied to claims 22, 23, 26, 27, and 30-35, above, and further in view of Chalilpoyil (US 5,401,590).

Patentability of amended independent claim 22 has been argued, supra. Claim 36-37 depend from independent claim 22. Applicant's claims 36-37 recite that surfactants such as organic phosphate esters may be included in the zinc anode mixture. The added reference Chalilpoyil '590 discloses use of surfactants, such as organic phosphate esters, for inclusion into zinc anode mixtures. Amended independent claim 22 is believed patentable over the references Une (JP '270) and Lin (JP '011) as above argued. Dependent claims 36-37 reflect a specific embodiment of the invention and further restricts the subject matter of claim 22. Therefore, claims 36-37 should be deemed patentable, if amended claim 22 is allowed. The above rejection of claim 36-37 is believed traversed and withdrawal of the rejection is requested upon the Examiner's reconsideration.

Remaining dependent claims within the group of claims 23-39 of record not specifically argued herein all depend either directly or indirectly from main claim 22. These claims all reflect specific embodiments of the invention which further restrict the main claim 22 and should be allowable if amended main claim 22 is allowed. Allowance of the dependent claims is requested upon the Examiner's reconsideration.

**XI. New Claim 68 dependent on base claim 22 is specifically patentable, since none of the cited references discloses the range of pressure applied to the wet zinc mixture in the mold cavity to compact the wet mixture therein, as recited in claim 68.**

A new claim 68 dependent on independent claim 22 has been added. Claim 68 recites that the pressure applied to said wet mixture as recited in claim 22 (step a.2) corresponds to a force of between about 10 and 300 pounds applied by a plunger to said wet mixture in a cylindrical mold cavity having a diameter between about 3 and 7 mm, thereby compacting said wet mixture within the mold cavity. (Support in the specification appears at p. 24, lines 15-24 and Figs. 1 and 3B) The representative mold cavity 630 (Fig. 3B) can be cylindrical as in the zinc/air cell anode cavity 255 (Fig. 1)

As above argued none of the cited references discloses or contemplates the use of applying pressure to a wet zinc mixture within a die mold cavity to compact the wet mixture therein and then ejecting the compacted wet mixture from the mold cavity, as Applicant now recites in independent claim 22, wherein the compacted wet zinc mixture retains its shape. Now, furthermore, none of the cited references alone or in any combination can be said to disclose or contemplate the specific pressure range applied to the wet mixture in said mold cavity as recited in new claim 68. Accordingly, new claim 68 is believed to be specifically patentable and allowance of claim 68 is requested upon the Examiner's reconsideration of the application.

**XII. Claims 31 and 32 dependent on base claim 22 recite preferred gelling agents which function as a supplement binder in conjunction with the polyvinylalcohol. In the context of Applicant's method recited in claim 22, claims 31 and 32 should be specifically patentable, along with claim 22.**

Applicant is seeking to patent method claims depicting a method comprising steps of pressure molding a wet zinc mixture producing a compacted wet zinc mixture comprising zinc particles, polyvinylalcohol, gelling agent and water, but the gelling agent is not yet activated in the wet zinc mixture because alkaline electrolyte has not yet been added. (Claims 31 and 32 reflect the inclusion of specific types of gelling agents during preparation of the wet zinc mixture along with inclusion of polyvinylalcohol.) A wet zinc mixture is inserted into a die mold cavity and pressure is applied to the wet zinc mass in the mold cavity to compact the mass therein. The compacted wet zinc mixture retains its shape upon ejection from the mold. The compacted wet zinc mixture is heated to result in a dry solid mass comprising zinc particles. The dry solid mass is inserted into the anode cavity of a zinc/air cell. Alkaline electrolyte is added to the dry solid mass inserted into the cell's anode cavity. The gelling agents become activated and help absorb the electrolyte and cause the dry solid mass comprising zinc particles to expand forming the final anode mixture. (Applicant's specification at p. 29, lines 1-23). **Because polyvinylalcohol is present in the zinc mass, the zinc particles in Applicant's final anode mixture (after electrolyte is added) are held together in a tighter network than conventional zinc slurries and without visible air pockets.** (Specification at p. 29, lines 13-17) Claims 31 and 32 thus reflect specific embodiments of the invention which enhances the performance of the molded product.

Specifically there is nothing in the references, including consideration of references Une (JP 56-116270) and Lin (US 6,300,011 B1), to suggest any benefit of employing both polyvinylalcohol and the above named gelling agents (claims 31 and 32) in a wet zinc mixture and molding the wet zinc mixture by the sequence of steps as recited in Applicant's base claim 22 to achieve a compacted wet zinc mixture, which retains its shape upon ejection from the mold cavity.

The Court has consistently held that under section 103 teachings of references can be combined only if there is some suggestion or incentive to do so. It is impermissible to reconstruct the claimed invention from selected pieces of prior art absent some suggestion, teaching, or motivation in the prior art to do so. See, ACS Hospital Systems, Inc. v. Montefiore Hospital, 221 USPQ 929 at 933 (CAFC 1984); C.R. Bard, Inc. v M3 Sys., Inc., 48 USPQ 2d 1225 (Fed. Cir 1998). There is no teaching or suggestion in the cited references, including consideration of Une and Lin, of combining various elements therein to arrive at Applicant's claimed method steps as recited in amended base claim 22 and as further specifically recited with the limitations of claims 31 and 32.

Accordingly, claims 22, 31 and 32 should be specifically patentable under 35 USC 103 in view of any of the cited references, whether viewed alone or in combination. Allowance of these claims is specifically requested upon the Examiner's reconsideration.



Applicant encloses herewith a set of formal drawings under cover of separate letter addressed to the Examiner.

Applicant has made the claims Amendment with every effort to place the application in condition for allowance. Formal allowance of the Application is respectfully solicited.

The undersigned attorney solicits a telephone call from the Examiner to clarify any questions which the Examiner may have concerning the application. Authorization is hereby given to debit Deposit Account 502271 for any amount owing or credit the same account for any overcharges in connection with this communication.

Date: Aug. 10, 2006

Respectfully submitted,

A handwritten signature in cursive script that reads "Barry D. Josephs".

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